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# COAL BEDS IN WESTMORELAND COUNTY

By

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## Introduction.

Westmoreland County stands a close second to Fayette County as a bituminous coal producer. These counties produce about one-third of the bituminous coal mined in Pennsylvania, and about one-ninth of the output of the United States.

In 1918 Westmoreland County produced 28,121,234 tons of coal, valued at $66,524,649. Of this amount, 18,961,259 tons, valued at $47,930,583 were loaded at the mines for shipment; 8,040,942 tons, valued at $16,106,849 were made into coke at the mines; 500,878 tons were sold to local trade and used by employees; 618,155 tons were used at the mines for steam and heat.

There are 16 coal beds of mineable thickness in the county. The Pittsburgh coal is by far the most important and is mineable wherever it occurs. The Brookville, Lower Kittanning, Middle Kittanning, Lower Freeport, Upper Freeport, Redstone, Sewickley, Uniontown, and Waynesburg beds are workable locally. The Mahoning, Brush Creek, Bakerstown, Harlem, Duquesne, and Washington coals may be utilized when the thicker beds are mined out.

Westmoreland County has been a large producer for many years, and the chief source of this supply, the Pittsburgh coal, is being exhausted rapidly. However, there are many other beds, yet undeveloped and even unprospected in some areas, which will become more and more important, and eventually supply the total output. Little attention has been given these beds until lately because the Pittsburgh coal has so overshadowed them. Much prospecting in recent years has proved that they lack continuity and uniformity but locally are mineable beds of good quality.

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Westmoreland County is in the southwestern part of the State, between Conemaugh, Allegheny, and Monongahela rivers. It is bounded on the north by Armstrong and Indiana counties, on the east by Cambria and Somerset counties, on the south by Fayette County, and on the west by Washington and Allegheny counties. Its shape is irregular, but its greatest width from east to west and north to south is about 40 miles. The area is 1,063 square miles, and the population in 1920 was 273,568, or about 257 per square mile.

The main line of the Pennsylvania Railroad enters the county east of Seward, and runs through Derry, Latrobe, Greensburg, and Jeannette to Pittsburgh, giving fine transportation facilities to every coal district near it. Branches from the main line serve the mining towns scattered over the county. The main line of the Baltimore and Ohio Railroad follows the Youghiogheny across the southwest corner of the county and has a branch to Everson and Mount Pleasant. The Pittsburgh and Lake Erie Railroad follows the west bank of the Youghiogheny across Rostraver township. The Ligonier Valley Railroad runs between Latrobe, Ligonier, and Wilpen. The Pittsburgh, Westmoreland, and Somerset Railroad runs from Ligonier across the eastern county line to Somerset, Somerset County.

Although Westmoreland County has but few miles of frontage on the Monongahela, many tons of coal are shipped each year by barge, especially to Pittsburgh and points along the Ohio.

The county has an unusually large mileage of improved roads. Most of the township roads are dirt, and are kept in good condition. More coal is hauled over the roads in the eastern than in the western townships, because they are not so well served by railroads. During the time of excessive prices for coal, thousands of tons were hauled to sidings, but now little coal is hauled over the roads except for local use.

With these transportation facilities Westmoreland County can ship its coal to any point. A large percentage of the coal is made into coke for use in the furnaces at Pittsburgh; an enormous amount is shipped to large cities for gas manufacture; the remainder is used for steaming purposes. Probably the largest tonnage is shipped to the Central States and to the lake trade.

The topography of the county is diversified. Laurel Ridge, along the eastern boundary is over 4000 feet high and, with Chestnut Ridge, forms a mountainous belt. The county west of Chestnut Ridge is decidedly hilly, but these hills rise to a common level, and viewed from a high point resemble a gently rolling plain. The main streams flow across anticlines through narrow gorges; in the basins they have broad fertile valleys with gentle slopes. Four great terraces, the remnants of which represent the Schooley, Harrisburg, and Worthington peneplains and the Parker strath, have great extent in the county. Elevations range from 4200 feet above sea level on the crest of Laurel Ridge, to 750 feet on Monongahela River.

## STRUCTURE.

Eleven structural features each having a general southwest trend

have been recognized and studied. They are, in order from east to west: Laurel Hill anticline, Ligonier syncline, Chestnut Ridge anticline, Latrobe syncline, Fayette anticline, Greensburg syncline, Grapeville anticline, Irwin (Port Royal) syncline, Elders Ridge syncline, Murrysville anticline, and Duquesne syncline.

Laurel Hill anticline, on the eastern edge of the county, is a great fold that has brought the Pottsville and Mauch Chunk rocks to outcrop. The axis is 4200 feet above sea level on the county line southeast of Wilpen; from that point it dips gradually north and south. The rocks dip steeply but regularly into the Ligonier syncline on the west.

Ligonier syncline crosses the Conemaugh below New Florence, extends southwest, and leaves the county midway between Jones Mills and Donegal. It is a long narrow basin with irregular dips and minor folds along its axis. The rise of the rocks to the east averages about 25 per cent, and is fairly regular, but on the west the rise is irregular, with local dips as high as 80 per cent.

Chestnut Ridge anticline, lying west of Ligonier syncline, crosses the north boundary of the county near Bolivar, and leaves the south boundary a few miles west of Donegal. It is a pronounced fold, having, with local exceptions, regular dips on both flanks. The total descent is greater on the eastern side. The axis varies much in elevation.

Latrobe syncline, lying northwest of the Chestnut Ridge anticline, forms a long narrow basin extending between Blairsville and Scottdale. The axis varies in elevation as though affected by numerous small cross anticlines. The dips on the east flank are rather high and regular but on the west flank they vary greatly.

Fayette anticline, the next structure to the west, crosses the Conemaugh a few miles west of Blairsville, and extends southwest to Jacobs Creek, a few miles west of Tyrone Mills. Its maximum development is on Jacobs Creek and at a point west of Latrobe. It descends about 2 miles northeast of Loyalhanna Creek, rises again into an elongated dome, then plunges and rapidly disappears near Conemaugh River.

Greensburg syncline crosses the county from just west of Blairsville, through Greensburg to Sewickley Creek, its total length in Westmoreland County being about 26 miles. It is a minor feature on Sewickley Creek, but deepens rapidly to a point 2 miles north of Greensburg where the Pittsburgh coal is 775 feet above sea level. The axis rises gradually to the northeast, the Pittsburgh coal being nearly 1300 feet above tide north of New Alexandria. The dips are regular on both flanks.

Grapeville (Jacksonville) anticline crosses the Conemaugh about 2 miles southeast of Saltsburg, extends southwest near Jeannette and ends just north of Walts Mill on Sewickley Creek. The anticline rises gradually from Sewickley Creek to a point about 3½ miles northeast of Jeannette, where the Pittsburgh coal is 1800 feet above sea level. The elevation of the axis decreases gradually northeast, the

Pittsburgh coal having an elevation of 1630 feet a mile north of Congruity. The dips are regular and gentle on both flanks.

Irwin (Port Royal) syncline has its northern end about 2 miles north of Export, and extends southwest through Manor, crossing the Youghiogheny at Port Royal just west of Smithton. In the vicinity of Herminie the basin is broad and flat, with the Pittsburgh coal less than 600 feet above tide. The basin narrows, the slopes become steeper, and the axis rises northeast to a point about 1 mile southeast of Export, where the Pittsburgh coal is 950 feet above tide. The axis rises more rapidly northeastward and the Pittsburgh coal outcrops 3 to 4 miles northwest of Export, where a minor roll splits the syncline.

Elders Ridge syncline is really a continuation of the Irwin syncline with a saddle separating them. The axis dips gently northeast, and continues as a minor structure across the Kiskiminitas at Edri.

Murrysville anticline crosses the Kiskiminitas a few miles west of Salina, extends southwest near Murrysville and leaves the county about 1 mile southwest of Trafford City. It is a broad, well developed structure, with gentle, uniform dips on both flanks. At Trafford City the Pittsburgh coal is 1280 feet above sea level; the axis rises rapidly northeast until the Pittsburgh coal is 1750 feet above sea level near the Kiskiminitas.

Duquesne syncline crosses the northwest corner of the county as a broad shallow basin with the rocks rising gently on both flanks. The axis is fairly uniform in elevation.

The northern continuation of the Amity anticline probably extend along Allegheny River in Westmoreland County. It has not been studied, but evidently is a minor feature.

## STRATIGRAPHY.

The outcropping rocks of Westmoreland County belong to the Quaternary, Carboniferous and Devonian systems. The Quaternary system is represented by river deposits of recent age, and by the Carmichaels formation. The Carboniferous system is represented by the Washington, Monongahela, Conemaugh, Allegheny, Pottsville, Mauch Chunk, and Pocono. The Devonian is represented by the Catskill formation.

The stream deposits are sands, clays, and gravel which the streams are depositing on their flood plains at high water. The Carmichaels formation is limited almost entirely to the larger valleys, where it occurs as unconsolidated terrace deposits of sand, clay, and gravel.

The Washington formation has been almost entirely eroded from the county, remaining in a few hilltops in the deepest basins, particularly in the southwestern part of the county. It is composed of shales, thin limestones, shaly sandstones, and one workable coal bed.

The Monongahela formation is present only in the synclinal basins. It contains five workable coal beds, including the Pittsburgh coal. The formation is extremely calcareous, with few massive sandstones and many feet of sandy shales. It averages about 400 feet thick.

The Conemaugh formation is present in the basins and on the flanks of the synclines. It is composed chiefly of green and red shale, several coarse sandstones, numerous thin limestones and five coal beds that locally are of workable thickness. Its average thickness is about 645 feet.

The Allegheny formation is present in practically the entire county, except where the anticlines have raised the Pottsville to outcrop in the high ridges. It is composed laregly of shale, with a few heavy sandstones, clay beds, limestones, and three coal beds locally of workable thickness. Its average thickness is about 285 feet.

The Pottsville formation, outcropping only on the high ridges in the eastern part of the county, is composed of two massive sandstones, with sandy shale between them. It is not coal bearing.

The Pocono and Catskill formations are composed of massive sandstones and a heavy bed of siliceous limestone. They are not coal bearing. They have a limited outcrop on the crests of Laurel and Chestnut Ridges.

## COALS.

The following table shows the stratigraphic relation of the coal beds, their range in thickness, and the average intervals between them.

Coal Beds in Westmoreland County

| | Name of bed | Average interval | Range in thickness of coal beds |
|---|---|---|---|
| Monongahela 400 | Washington | 120 | 0 - 2'0" |
| | Waynesburg | 115 | 0 - 10'6" |
| | Uniontown | 145 | 0 - 2'0" |
| | (Benwood?) | | |
| | Sewickley | 75 | 0 - 1'0" |
| | Redstone | 65 | 0 - 6'6" |
| | Pittsburgh | 280 | 5'0" - 8'0" |
| Conemaugh 645 | Duquesne | 35 | 0 - 1'2" |
| | Harlem | 60 | 0 - 4'0" |
| | Bakerstown | 170 | 0 - 7'4" |
| | Brush Creek | 45 | 0 - 1'6" |
| | Mahoning | 55 | 0 - 3'0" |
| Allegheny 285 | Upper Freeport ("E") | 60 | 0 - 7'2" |
| | Lower Freeport ("D") | 50 | 0 - 2'10" |
| | Upper Kittanning ("C'") | 40 | 0 - 5'0" |
| | Middle Kittanning ("C") | 40 | 0 - 5'0" |
| | Lower Kittanning ("B") | 60 | 0 - 5'0" |
| | Clarion ("A'") | 35 | 0 - 3'6" |
| | Brookville ("A") | | 0 - 5'0" |

The Westmoreland County coal field is divided into districts by four synclinal basins, which are named from the principal towns situated in them; Ligonier basin, Latrobe basin, Greensburg basin, and Irwin basin. The coals differ in thickness, number, chemical quality, and physical character in each of these basins or districts. The important coals will be discussed by districts; to avoid repetition the less important ones will be discussed with the county as a unit.

## Allegheny Coals.

Brookville ("A") Coal. This bed, lying a few feet above the Pottsville sandstone and having a maximum thickness of 5 feet is extremely impure. Its average thickness is 18 inches. The bed was opened in the Ligonier district many years ago for domestic fuel, but the openings are now fallen shut. In the central and western parts of the county the bed lies at great depth, and is known only from drill records; locally it gives promise of some value.

Clarion ("A'") Coal. The Clarion coal is thinner but better in quality than the Brookville coal. It is sulphurous and carries many partings. Where prospected in the Ligonier district, it has a maximum thickness of 3 feet 6 inches but is dirty. West of Chestnut Ridge it is several hundred feet under cover and may never be mined.

Middle Kittanning ("C") Coal. This bed is almost entirely lacking in eastern Westmoreland County. On Indian Creek it locally reaches a maximum thickness of 2½ feet, but is dirty. In the northern part of the Ligonier basin it is a thin but clean coal that may be used when the thicker beds have been worked out. It is deep under cover in the central and western parts of the county, has been recorded in many drill records, and is locally a good thick coal.

## Conemaugh Coals.

There are several thin coals in the Conemaugh formation that have no commercial importance at present. These are, in ascending order: Mahoning, Brush Creek, Anderson, Bakerstown, Harlem, Duquesne, Wellersburg, Little Clarksburg, and Little Pittsburgh. Of these, the Mahoning, Brush Creek, Harlem, and Duquesne may be mined locally in the future, when the thicker beds are worked out.

Mahoning Coal. About 55 feet above the Upper Freeport, is a dirty bed of coal, nowhere over 3 feet thick, that has been used locally for house fuel. It contains one main shale parting near the middle and several thin ones scattered through the bed. The Mahoning coal averages 33 per cent volatile matter, 52 per cent fixed carbon, 10 per cent ash, and 3 per cent sulphur.

Brush Creek Coal. A bed found 45 to 60 feet above the Mahoning coal has been correlated as the Brush Creek. It is a thin coal of good quality and has been mined in many places for house fuel. It averages 12 inches thick, has no partings, and is low in sulphur and ash.

Bakerstown Coal. The Bakerstown coal, lying about 60 feet below the Harlem coal, is very irregular in thickness and commonly is thin. The bed is thickest 4½ miles southwest of Greensburg on Little Sewickley Creek where it has been mined and mistaken for the Upper Freeport. Here it is composed of 5 feet of soft coal, 16 inches of cannel coal, and 1 foot of bony coal. The coal is 32.7 per cent volatile matter, 44.9 per cent fixed carbon, 20 per cent ash, and 2.6 per cent sulphur.

Harlem Coal. This bed, lying about 315 feet below the Pittsburgh coal, averages 1 foot thick and locally has a maximum of 4 feet. The coal is an excellent smithing and steam coal and has been used more than any other Conemaugh coal for house fuel.

Duquesne Coal. This bed has been recorded only in the western part of the county, where locally it is over 12 inches thick. It appears to be good coal but has been little used.

## Coals above the Pittsburgh Bed.

The Pittsburgh bed is now the most important coal in the county. At the present rate of exhaustion it will last hardly 20 years. That fact has led the coal companies to prospect the thin coals lying above the Pittsburgh bed.

Pittsburgh Rider Coal. This bed, which directly overlies the Pittsburgh bed, locally is over 2 feet thick, but is very shaly. It is never mined and gives little promise of future utilization.

Redstone Coal. This bed lies on an average about 65 feet above the Pittsburgh bed. It has been mined extensively for house fuel, and during war time for shipping coal. At present it is mined for shipment in a few places. Its occurrence is restricted to the hills in the basins. North of the main line of the Pennsylvania Railroad the coal is very thin and is entirely lacking in large areas. It averages less than 2 feet thick, but it thickens south toward Youghiogheny and Monongahela rivers, and in some places is over 5 feet. The coal is generally good, and the bed is free from partings, with the exception of a local 3-inch clay band near the top. Roof and bottom "rolls" are common.

The Redstone coal probably is thickest and best in the townships south and southwest of Greensburg. South of Madison Station the bed is 6 feet 6 inches thick, with a 3-inch clay parting in the upper part. In Sewickley township it is 4 feet thick in many places. The bed varies greatly in Hempfield township, but it has been opened in many places, and will be in demand in the future. In North Huntingdon township the bed ranges from 6 to 30 inches in thickness and has been opened for house fuel.

Sewickley Coal. This bed has an average interval of 140 feet above the Pittsburgh bed in Westmoreland County. It is a very dirty bed restricted to the hilltops of the Greensburg basin. It has never been mined.

Benwood Coal. A coal lying between the benches of the Benwood limestone in the Greensburg and Irwin basins averages about 12 inches thick, and has been opened at one point, where it is over 3 feet thick. The bed is lenticular and varies greatly in thickness within a few hundred feet.

Uniontown Coal. This bed, occurring about 285 feet above the Pittsburgh bed, is thin in Westmoreland County. Probably it is thickest in townships bordering Monongahela River. It has not been prospected, but its outcrop indicates that it is very impure.

Waynesburg Coal. The Waynesburg bed is present in the townships bordering Monongahela River. Here it has a maximum thickness of 10 feet 6 inches and has been mined for local use. The coal is extremely impure and the bed carries many clay and bone partings. It is thinner on Sewickley Creek, but has better quality, and has been mined.

Washington Coal. This bed is present only in the highest hilltops in the southern part of the Irwin basin. The coal is soft and impure. It has been opened by farmers but probably will never be mined extensively.

## LIGONIER DISTRICT.

Lower Kittanning Coal. This bed outcrops along the Conemaugh, and on the east and west slopes of the Ligonier basin. Although it is very important on the Conemaugh, very few openings have been made in it elsewhere. The bed appears to be entirely lacking on Chestnut Ridge, but on Laurel Ridge it is a good thick coal.

The Lower Kittanning coal averages about 3 feet thick in St. Clair township, where it will be mined extensively in the future. At Boltz it is 2 feet 9 inches thick, with a small bone parting near the middle. At Seward it is 3 feet thick, and has only one small parting in the lower half. The bed is thicker at New Florence, but the upper part is bony and impure, and the binder in the middle is much thicker than at Seward. The coal is 4 feet 6 inches thick at Lockport in Fairfield township, but has a large shale parting near the middle, besides several local bone partings. The bed is 3 feet thick at Bolivar, but is very dirty and high in sulphur.

In Ligonier and Cook townships the bed has been opened only along Laurel Ridge. Here it ranges from 3 feet 6 inches to 4 feet thick, with an impure bony top bench 1 foot thick, and a thin parting in the middle. The coal, which is fairly high in ash and sulphur, is hard and blocky above the parting; below it, soft and friable.

The Lower Kittanning has been mined at Kregar in Donegal township, where it is 3 feet 8 inches thick, and has only one small bone binder near the middle. The quality is excellent and the bed is free from "rolls". Although it has not been prospected much in this township, there are indications that the Lower Kittanning may be mined extensively in the future.

Upper Kittanning Coal. The outcrop of this bed is confined to the valley of Conemaugh River, the west slope of Laurel Ridge, and to the east slope of Chestnut Ridge. It has been opened in a few places for house coal, but not for shipping. The coal is clean, averages about 20 inches thick, and is fairly low in ash and sulphur. Extreme variability in thickness makes mining uncertain. The coal reaches its maximum thickness of 5 feet in St. Clair township, where it has been mined for local use, and carries several thin bone partings, and a local "draw slate" on the roof. It is 22 inches thick on Tubmill Creek, and 2 feet 8 inches thick on Baldwin Creek.

In Fairfield township, the coal varies much but averages 20 inches thick. It has been opened for local use by farmers, and is a good clean coal, free from partings.

In Ligonier and Cook townships, the Upper Kittanning coal has not been mined. Its outcrop averages about 18 inches thick. Little is known of its extent and character in Donegal township but probably it will not exceed 18 inches in average thickness.

Lower Freeport Coal. In Donegal, Cook, and Ligonier townships the Lower Freeport coal is thin and irregular, at most measuring 20 inches. It has not been opened, but apparently is clean and free from partings.

On Tubmill Creek, Fairfield township, the coal is 2 feet 8 inches thick including a 3 inch clay parting 11 inches from the bottom, and 2 inches of bony coal at the top. On the Conemaugh it is 2 feet 10 inches thick, with a 1 to 3 inch bone parting 10 inches from the bottom. The coal is hard, very high in fixed carbon, medium in ash, but high in sulphur.

In St. Clair township, the bed is extremely irregular, ranging from a few inches to 2 feet thick. Examination of the coal is difficult because openings made to supply local demand are now fallen shut.

Upper Freeport Coal. This bed is easily accessible in every township in the Ligonier district, and has been mined in many places for local use and for shipment. It is extremely variable in thickness and quality, but is a very valuable coal in some areas. It appears to be thin on Laurel Ridge, thickening toward the center of the basin, and to its western outcrop on Chestnut Ridge.

The bed outcrops on the west slope of Laurel Ridge in St. Clair township, and has been mined extensively for custom coal on Baldwin Creek. It averages about 3 feet thick, and is good, clean coal, though locally it carries two or three thin shale partings, and a few inches of bone coal at the top. The upper part of the bed is a hard coal with brilliant lustre, the lower part is dull, friable, and rather high in sulphur. A local lower division of the bed, which is not mined, ranges from 8 to 20 inches thick, and is separated from the main part of the bed by more than a foot of fire clay.

The Upper Freeport coal has been mined commercially in Fairfield township only along Conemaugh River. Large untested areas, especially

along the western slope of Laurel Ridge, give promise of great future value. The greatest thickness of the bed on Tubmill Run is reported to be 8 feet 7 inches, including all impurities. The upper division is 3 feet 5 inches thick, with a 1 to 4 inch bone parting 12 inches from the top. The coal is hard, brilliant, and fairly low in ash and sulphur. The lower division, 4 feet 6 inches thick, is separated from the upper division by an 8-inch shale parting. This lower coal is dull, friable, and carries pyrite nodules as the only distinct impurity. The bed has a maximum thickness of 7 feet 5 inches at Lockport, including a 2-inch clay parting about 2 feet above the bottom. The coal is hard and high in ash and sulphur. The fixed carbon is also high. The bed averages between 6 and 7 feet thick at Bolivar, where it is mined extensively. Bony coal, 10 to 12 inches thick at the top of the bed, is the principal impurity. Pyrite makes the bed rather high in sulphur.

In Ligonier township the whole bed is 5 to 7 feet thick. The upper division has a maximum thickness of 4 feet 4 inches, and is invariably divided into two benches by a 2-inch bone parting. The lower division, which is inferior in quality, and varies greatly in thickness is separated from the upper division by 11 inches of clay. West of Ligonier on Loyalhanna Creek the bed is locally in one bench, with a maximum thickness of 4 feet 2 inches. The coal is rather dirty and high in sulphur, although locally its quality is excellent.

In Cook and Donegal townships the bed is thin and often lacking along the west slope of Laurel Ridge. It appears to thicken in the center of the Ligonier basin and on the east slope of Chestnut Ridge. This area has not been tested sufficiently as yet to give an accurate idea of the thickness and quality of the coal. At Kregar, a coal, which probably is the Upper Freeport, is 4 feet 6 inches thick, including generally 3 small bone partings. This thickness appears to be local. At Roaring Run the bed is double. An upper 8 inch division is separated from the lower division, 2 feet thick, by 3 feet of clay and shale.

Pittsburgh Coal. This bed is present only on the high divides in the center of the basin in Ligonier and Fairfield townships, and underlies only a little more than 3000 acres. Much of it has been mined out. The upper division of the bed is seldom over a few inches thick, and the lower division is 7 to 8 feet thick, including two or three thin bone partings. The coal is soft, friable, and prismatic in structure. The sulphur ranges from below 1 to 3 per cent, and the ash from 6 to 9 per cent. The fixed carbon averages 64 per cent and the volatile matter 24 per cent.

## LATROBE BASIN.

Kittanning Coals. The correlation of the Kittanning coals in the Latrobe basin is very indefinite because these coals lie at considerable depth in the center of the basin and have not been prospected where they outcrop on its flanks.

At least one of the Kittanning coals is mineable. On Chestnut

Ridge, a coal, probably one of the Kittanning coals, lying about 160 feet below the Upper Freeport is 3 to 4 feet thick. Where opened about 3 miles north of Long Bridge, it is 3 feet 3 inches thick. A bed that probably is the Upper Kittanning has been opened on Chestnut Ridge southwest of Loyalhanna Creek, and is 5 feet thick, including 2 feet of shale in the middle of the bed. On Chestnut Ridge southeast of Latrobe, a bed 100 to 130 feet below the Upper Freeport, is 3 feet thick.

A coal in the Kittanning group has been recorded in many oil and gas drillings. It ranges from a few inches to 4 feet thick.

Lower Freeport Coal. This bed, lying about 60 feet below the Upper Freeport, is extremely variable in thickness, and is entirely lacking in large areas. Its greatest thickness probably is on its eastern outcrop on Chestnut Ridge.

Upper Freeport Coal. This coal is the most important bed in the Allegheny formation, and is of mineable thickness practically everywhere in the Latrobe basin. It has been opened southeast of Mammouth, where it is 5 feet thick, including a 1 inch bone parting six inches above the bottom. It probably maintains this thickness in a large area. The Upper Freeport coal has been mined extensively for local use on the western slope of Chestnut Ridge in Unity and Derry townships. Just north of Kingston, near Loyalhanna Creek, the coal is 4 feet thick, and clean. At Youngstown the bed is 4 feet 5 inches thick, including 1 inch of clay 2 feet 10 inches from the top; on Miller Run, 4 feet 4 inches thick, including 2 inches of clay one foot from the bottom; one mile south of Derry 6 feet 9 inches thick, including 14 inches of shale 2 feet 4 inches from the bottom.

The coal thickens north of Loyalhanna Creek, and east of Derry measures 7 feet 2 inches, including 18 inches of shale 2 feet 6 inches from the bottom. Just east of Derry, on the summit of Chestnut Ridge, the coal is 6 feet 3 inches thick, including 3 inches of shale four feet from the bottom. The coal is opened at many places between Derry and the Conemaugh, and is 2 to 4 feet thick.

Pittsburgh Coal. The Latrobe basin includes the northern end of the Connellsville coking coal field. The Pittsburgh coal has the same coking quality as at Connellsville, except in the area northeast of Latrobe.

The Pittsburgh coal in the Latrobe basin consists of a roof division, a main clay parting, and a main division. The roof division is worthless, being composed of a number of alternating bands of coal and clay.

The lower division consists of an upper bench, the "breast" coal, 3 to 4 feet thick; underlying this is a small bench, from 2 to 4 inches thick, separated from the coal above and below by knife edges of bone. This "bearing-in" bench is underlain by a bench 1 foot thick, which, from its blocky character, is generally known as the "brick" coal. An impure bottom bench 12 to 18 inches thick is separated from the "brick" coal by a thin bone parting. This bench is generally so impure that it is not mined.

The Pittsburgh coal is 5 to 6 feet thick at Millwood, and carries the characteristic impurities; near Blairsville it is 6 feet thick, including 1½ inches of bone two feet from the bottom. On Union Run it is 7 feet 6 inches thick, including 14 inches of partings; at Beatty, 7 feet 11 inches thick, including two 1 inch partings. Here the lower bench is very dirty. The coal has the same characteristics at Whitney, Hostetter, and Baggaley. At Klondike it is 7 feet 9 inches thick, including two 1 inch clay partings. At Mammouth the Pittsburgh coal is mined by shaft 110 feet deep, and is 6 feet 6 inches thick, including a ½ inch bone parting three feet from the top.

## GREENSBURG BASIN.

Kittanning Coals. In the Greensburg basin as in the Latrobe basin, the Kittanning coals are under deep cover, and their correlation is uncertain. Records of diamond drilling indicate that one of these coals, probably the Middle Kittanning, is of mineable thickness locally.

Lower Freeport Coal. This bed, about 60 feet below the Upper Freeport, is continuous but so thin that it is not mineable in the Greensburg basin.

Upper Freeport Coal. The Upper Freeport is by far the most important coal in the Allegheny formation in the Greensburg basin. It ranges from 3 feet to 6 feet 1 inch thick in Loyalhanna township. The quality is good, but usually the bed carries two or three shale or clay partings. This coal has been replaced by sandstone in most of Salem township, and in the northern part of Hempfield township. In southern Hempfield township, near Hunkers, the coal ranges from 4 feet 11 inches to 5 feet 6 inches thick, including a 2 inch clay parting 22 inches above the bottom. Near Ruffsdale the bed is 2 feet 3 inches thick, including two clay partings 1 and 2 inches thick.

Pittsburgh Coal. The Pittsburgh coal is primarily a steam coal in the Greensburg basin, although it can be used as a coking coal after washing. It is soft and friable, but mines out in good sized lumps. Its character is the same in the Latrobe and Irwin basins.

## IRWIN BASIN.

Kittanning Coals. The Kittanning coals lie deep under most of the Irwin basin, and are known only from diamond drill records. The Upper Kittanning appears to be absent; the Middle Kittanning is thick enough to mine in large areas; the Lower Kittanning is thin, lenticular, and mineable only locally.

The Middle Kittanning bed is 1 to 5 feet thick 1¼ miles west of Salina; 2 feet 10 inches thick in southeastern Franklin township; 3 feet 8 inches thick in northeastern North Huntingdon township; and 3 feet 7 inches thick in northern Sewickley township. These thicknesses may be local.

The Lower Kittanning coal is 2 feet thick in southern Franklin township; 2 feet 2 inches thick in North Huntingdon township; and 2 feet 10 inches thick in northern Sewickley township. It is either very thin, or entirely lacking in Rostraver township.

Lower Freeport Coal. This bed is lenticular, and nowhere over 12 inches thick in the Irwin basin.

Upper Freeport Coal. The Upper Freeport coal is the most important coal in the Allegheny formation in the Irwin basin. In Allegheny, Washington, Bell, and Loyalhanna townships, it ranges from 3 feet to 4 feet 4 inches thick and generally is clean except for local bone partings. In Upper and Lower Burrell townships the bed ranges from 3 feet 6 inches to 5 feet 8 inches thick, is very dirty locally, and carries several bone and shale partings in addition to a few inches of bony coal at the top of the bed.

The Upper Freeport coal is "faulted out" by sandstone in southern Washington and northern Salem townships; in all of Franklin but the northwestern corner; all of Penn township; in northern Hempfield; and southern North Huntingdon township.

In Sewickley township the Upper Freeport ranges from 2 feet to 4 feet 2 inches thick, and usually carries two or three clay and shale partings. The bed has a local maximum thickness of 6 feet in Rostraver township.

The Upper Freeport coal in the Irwin basin averages approximately 33 per cent volatile matter, 55 per cent fixed carbon, 8 per cent ash, and 2 per cent sulphur. It is a soft, friable coal that breaks up when mined.

Pittsburgh Coal. This bed has been the most important one in the Irwin basin in Westmoreland County for many years, and is now approaching complete exhaustion. It is the standard gas coal of western Pennsylvania, and is used with great success as a steam and by-product coking coal.

The bed is in two divisions, as in the Latrobe basin. The upper division is composed of alternating bands of coal and clay, and is too impure to be mined. It is separated from the lower division by 10 to 12 inches of clay.

The lower division of the Pittsburgh coal averages 6 feet 6 inches thick in the Irwin basin of Westmoreland County. It is divided into four benches by thin bony coal partings. The top bench is called the "breast" coal, and is from 3 feet 6 inches to 4 feet thick; a thin bone parting separates the "breast" coal from the "bearing-in" bench, which is from 4 to 6 inches thick. The "brick" coal is about 18 inches thick, and is separated from the "bearing-in" coal and the "bottom" coal by thin bone partings. The bottom coal is impure, and rarely mined.

The lower division of the Pittsburgh coal averages 6 feet 4 inches thick in the townships north of the main line of the Pennsylvania Railroad, but thins to an average of 5 feet 10 inches in the

townships south of the main line. In the southern and western parts of South Huntingdon township, it locally averages 7 feet 1 inch thick.

The Pittsburgh coal in the Irwin basin is soft and friable. It ranges from 32 to 36 per cent volatile matter, averaging 33 per cent; 53 to 58 per cent fixed carbon, averaging 56 per cent; 6 to 9 per cent ash, averaging 7.5 per cent; .8 to 1.5 per cent sulphur averaging 1 per cent.